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ABSTRACT

In a world where science has become too confined to books and too reliant on technology, and science fairs have been taken over by parents, this paper offers suggestions to help young people have actual hands-on experience with nature. Topics include soil formation; ants; earthworms; temperature; weather predictions; rain acidity; physical science (sound, light, heat); animal tracks; potato stamps; snow; gardens; compost; invertebrates; squirrels; pigeons; bird feeders; bird houses; bird watching; trees; and herbariums. Suggestions are given for adapting the activities to different age levels and to group activities. (SAS)

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PUTTING SCIENCE INTO ELEMENTARY SCIENCE FAIRS

We live in a constantly changing world. Scientific discoveries have changed our life styles, opened doors to the universe, and forced us to rethink accepted "facts". The child psychology of the 1930's failed to recognize the abilities and needs of little folk. In the early 1940's the concepts of biochemistry were just being discovered, and at the end of the decade it was still appropriate for a science class to make a chart showing why travel to the moon was impossible. In a world changing as rapidly as this, our concept of education must also change. Now, as never before, science skills are essential. Not because we should be turning out a population of little scientists but because the science skills of drawing conclusions based on observation, questioning, experiments, measuring, recording, predicting, comparing, pooling knowledge, are essential to everyday living.

Unfortunately much of what is called science today teaches none of these skills. Instead workbook reading, memorizing facts and written tests one day a week often fulfill the science curriculum.

Many science fairs fail to stress the importance of the skills of science. In addition they teach other unfortunate things. At one elementary science fair that I judged in the 1970's and 80's a brother and sister were awarded first prize every year. They, and only they, had computers. Fortunately the school had three judges who worked independently so when judgments were pooled some other students had high ratings from judges who recognized the inequity involved and incidentally appreciated the imagination and independent thinking that some simpler studies represented.

As science fairs go, almost all have some parent involvement. There can be no doubt parents and children working together to make discoveries can build healthy relationships and develop skills, but displays developed and controlled by parents have no place at the fair.

At a fair that I once judged in an affluent suburb adjacent to several colleges and universities parents were very much in evidence, sometimes setting up the demonstration, lighting candles that little folk couldn't handle, prompting, "Tell the lady what's happening". Sometimes their presence was more discreet as a bright little 4th grader asked, "Would you like to read this poster before I start my demonstration?" "No, I'd like you to read it to me." So the youngster did, stumbling over words he could neither pronounce or understand.

In another area a crowd gathered around a six foot tall brightly colored structure made of Leggo pieces with marbles rolling down inclines, passing through tunnels, running around tilted circles as a small boy proudly announced, "My Dad and I built this. It demonstrates gravity." Nearby Dad and his friends speculated on ways to speed the descent of the marbles, on the influence of curves and other "What would happen if ?" questions. Too bad that the boy or a group of his friends had not been turned loose to experiment and find answers and draw conclusions themselves.

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The other eye catching exhibit was a 4 by 6 foot poster depicting the solar system and noting information sent back from space probes about atmosphere, rocks and composition of other planets. There was no comparison to Earth and neither the planets nor their orbits were drawn to scale. The sun was as small as Earth. When I asked about this I was told, "That would be too hard to do". The producers were really saying "That would take too much time." I was looking at a colorful library report that happened to be done on a science topic.

Science fairs vary. Some are well structured. Some have time for preparation. Some just happen or are put together in a rush - without listed objectives, goals, or rules. After my initial negative reaction, culminating decades of experiences I began to look at the total picture. Obviously neither the teachers nor students had any direction. Obviously, too, everyone thought they needed to do something exotic, removed from everyday life. In fact, as I thought of it, I became even more concerned. There had not been one exhibit on living things: no plants, no animals, none of the components of life, nothing on water, weather, air, earth, rocks. Not only had no one thought of the skills that scientific discoveries entail they had not thought of applying them to the circle of life on Earth, our home. This I feel is particularly disturbing in an electronic world where many young people have no actual contact with the world of nature and its important relationship.

It was at this point that I began to say ,"What could kids do in their little corner of the universe?" Obviously this will differ so I started listing opportunities for research starting with a hard topped school ground.

1. - Soil formation. Are there places where the forces of weather are breaking rocks and making soil? Are there plants growing on the rocks or concrete? What kind? How did they get there? Are there lichens growing on rock surfaces? What does this tell you about air quality? Make drawings or take photographs to record your discoveries. Observe and record plants growing in a crack. Check them at 2 week intervals dating all the observations. How does this habitat affect plants? Plants affect the habitat?

2. - Ants frequently live under pavements. Their hills are composed of the soil particles excavated to make their galleries. Can the extent of the underground home be estimated by looking at the hill? Remember that the galleries would be rooms connected by tunnels. Check the ants. Are they all the same size? Color? What are they doing? What are they carrying? Why? Find another ant hill. How is it different? The same? There commonly are at least 4 species of ants in the N E and more in other areas. Students will not be able to see the young ants or pupas under the sidewalk but an ant home under a board of stone will permit a look at ant-family life.

3. - Earthworms from nearby soil often get stranded on concrete or asphalt when it rains. When the sun comes out they are programmed to go down. That gets them in trouble. With wet hands collect some worms. Watch their behavior. Research their structure. Draw their body parts. Give some of them a temporary home in a container with soil. Do a feeding study, a movement study. Ask other questions.

4. - Temperature studies can include radiation, convection and conduction experiments. How does sun and shadow affect temperature? Does it matter what time of

the day the measurements are made? What kind of weather? Make charts and graphs. What conclusions can be drawn?

5. - Do the same activities on a grassy plot. This can be 2 persons or a team study. Scientists frequently work together(collaborate).

6. - A hard top area can be a fine place to set up equipment for a weather station and make predictions. Use a Beaufort scale to judge wind speed. Devise a piece of equipment to tell wind direction. Make a rain gauge. Use weather flags to announce predictions. Make a 3 column chart recording your prediction, the official prediction, the actual weather. Surprisingly local predictions are often more accurate than official ones. Why?

7. - Collect and test rain for acidity. If this is being done as a state wide or other geographic study, join the effort, be part of the team. Compare local acidity to a larger area. Account for the difference. Can you join or initiate an effort to bring about positive change? I know a grade school that succeeded in changing the polluting school furnace. That was a one classroom effort - but efforts take initiators and coordinators.

8. - Physical Science Research:

Simple machines, sound, light, shadows, measurement, and heat are often more easily carried out on hard top surfaces.

9. - Tracks: You may be amazed by the animals that cross your yard. Make castings of the tracks in the snow. Put 3.5 cm. of water in a #10 can. Stir in snow until you have a thick soup. Now add plaster of Paris so it make a mountain peak above the snow line. Stir. This should be like thick cream. Gently pour into the track. Can you interpret the stories told by tracks? Date and record.

10. - Carve potato stamps of tracks and record stories.

11. - Snow can tell us much about air pollution. Catch fresh snow, or collect it from the upper surface of new snow. Put it in a jar with a lid. Date and set aside. Collect a jar from the same area each day. Summarize observations.

12. - Use snow to map microclimates. What are the factors that create temperature differences?

Where there is soil and plants biological possibilities are almost endless.

13. - A garden with individual planters , observations, measurements, et al.

14. - A composting project.

15. - A survey of invertebrates. Relationship to plants, sun and shadow, other animals.

16. - Squirrel census and activity. Outwitting squirrels!

17. - Pigeon watch.

18. - Making bird feeders.

19. - Feeder watch.

20. - Bird houses : Built after research on shape, size, placement, etc.
Record of success

21. - A record of the activities of a pair of birds rearing a family of young from nest building, (materials, who does it, trips involved, etc.) incubating, who does it?

How long? Feeding - what, how often, behavior of young, adults. Fledglings, how many leave the nest, who teaches flying skills? Observe the young's behavior. when the young are self sufficient what do the parents do? House sparrows are frequently available and easily observed. Other birds like robins, cardinals, blue jays, mourning doves, pigeons and mocking birds may also be observed. House sparrows are rarely interrupted by human observation and male and female markings make family involvement east to ascertain.

22. - Most schools have trees on or near the grounds. Do a biography: A year, a week, a month in the life of a tree. Look at residents and visitors. The effect of weather on the tree and its effect on weather. What about the tree's offspring?

23. - Do a survey of the trees in a block around your school (do not cross the street). Identify them. Do they have problems? Are these trees a good choice? Why? Their needs. How can they be helped? Which seem healthier than others? Why?

24. - Make herbarium sheets mounting leaves or flowers or small plants under clear contact on one side of a file folder. On the other side enter information. Put the name of the plant on the tab. Set up a file making plant information on the botany of your grounds available in a central place like the library. The list of possibilities could fill volumes.

Any of these activities can be done in part or combined. They can be adapted for different age levels. Little folk can make bird feeders, do a feeder watch, draw the birds they see. They can use clear contact to mount leaves, showing various shapes and sizes and colors, recording seasonal changes. They can grow plants. Radishes are extremely satisfying, onions from onion sets introduce another form of plant reproduction. Marigolds make good gifts, if plants mature before fair time record their growth with dated drawings. Collecting, housing , feeding an invertebrate animal can be very satisfying. Earthworms kept moist (never wet) and snails are extremely successful, and until you have dealt with a kindergartner in love with "My worm" you have missed a great experience. Records can be drawings.

If the youngest children are included in the fair the entry can be group activity. Working and learning together can be a most rewarding thing. Mrs. Wallace's Kindergarten Bird Feeder Project" can draw all kinds of interest and start other activities in the school.

Your fair could have announced categories that would guide young people into appropriate research channels. There could be time in the school program for researchers to pursue their activities. In on-going observations like how many feeding trips are made in one hour, by whom? a volunteer (not the parent of the researcher) might be asked to watch a student or a small number of students on the school ground.

With this kind of activity children can know the joy of accomplishment and will grow into citizens able to adjust to and contribute to the 21st century.